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最終頁に続く

(54) 【発明の名称】 チェーン用巻き加工品及び製造方法

1

(57) 【特許請求の範囲】

【請求項1】 矩形母材を巻き加工して円形開口ダイスに押し通してなるチェーン用巻き加工品において、該巻き加工品の周面に、円形開口ダイス押し通し時に塑性変形を吸収する複数の盲溝を設けたことを特徴とする、チェーン用巻き加工品。

【請求項2】 前記巻き加工品が両端を内プレートに圧嵌したブシュである、請求項1のチェーン用巻き加工品。

【請求項3】 前記巻き加工品が両端を内プレートに圧嵌したブシュを挿通したローラであり、前記盲溝を該ローラの内周面に形成した、請求項1記載のチェーン用巻き加工品。

【請求項4】 前記巻き加工品がローラに内嵌したブシュである、請求項1記載のチェーン用巻き加工品。

2

【請求項5】 複数の盲溝が形成された帯鋼を矩形母材に切断し、切断面を対峙させて円筒状成形品に巻き加工し、前記円筒状成形品を円形開口ダイスに押し通して前記円筒状成形品の塑性変形を前記盲溝に向って生じさせることからなる、チェーン用巻き加工品の製造方法。

【発明の詳細な説明】

【0001】

【発明の属する技術分野】 本発明は、チェーンの構成部品である内プレートに圧嵌したブシュ、前記ブシュを挿通したローラ、又は、ローラに内嵌したブシュとして用いるのに好適な巻き加工品に関する。また、本発明は、前記巻き加工品を製造するための方法に関する。

【0002】

【従来の技術】 図13は代表的なチェーンの分解斜視図である。この種のチェーンCは、内プレートL1及び外

プレートL2、内プレートL1に圧嵌されたブシュB、外プレートに圧嵌されブシュB内を貫通するピンP、内プレートL1間でブシュBを挿通したローラRを有してなり、ピンPとブシュBとの間やブシュBとローラRとの間の摺動部分に潤滑剤を介在させてなる。また、ローラRの代わりにブシュを内嵌したローラが使用されることもある。

【0003】これらのチェーン部品のうち、例えばブシュBは円筒状であり、帯鋼を切断した矩形母材を成形機等の手段で巻き加工して製造されることが多い。特公昭60-18850号は、このようなブシュBを巻き加工により製造する方法を開示している。この方法によれば、巻き加工品は、矩形母材を円筒状成形品に巻き加工した後、真円度等の各種寸法精度を向上させるために円筒状成形品を円形開口ダイスに押し通して製造される。

【0004】

【発明が解決しようとする課題】ところが、上記方法では、円筒状成形品を円形開口ダイスに押し通す際、円筒状成形品は材料の塑性流動により変形する。円筒状成形品はダイスと巻き芯間に挟圧されているので、材料の塑性流動は軸方向に生じ、完成品としての巻き加工品は塑性変形して軸方向寸法精度が低下する。

【0005】例えば、チェーンのブシュに上記巻き加工品を利用し、ブシュ軸方向寸法を基準にして、内プレートとブシュからなる内リンク組立体を組み立てると、内リンク組立体の外幅寸法がばらつく。内リンク組立体の外幅寸法が短くなると、外プレートと内プレートとの隙間が大きくなる。そのため、ピンとブシュ間の潤滑剤が流出して、チェーンの潤滑性能が低下するとともに、隙間が原因となって騒音発生やチェーンの強度低下が生じる。一方、内リンク組立体の外幅寸法が長くなると、外プレートと内プレートとの隙間がなくなり、チェーンの屈曲不良を生じる。

【0006】また、内リンク組立体の外幅寸法を基準にして、内リンク組立体を組み立てる場合もある。このとき、ブシュの軸方向寸法が短いと、そのブシュと内プレートの嵌合面が小さくなり、嵌合力低下による疲労強度の低下が生じる。一方、ブシュの軸方向寸法が長いと、内プレートの外側から突出するブシュが外プレートと摺動して摩耗粉を発生させ、チェーンの寿命低下が生じる。

【0007】ローラやローラに内嵌したブシュに上記巻き加工品を利用した場合においても、軸方向寸法のばらつきによって、潤滑性能の低下やチェーンの寿命低下等の問題を生じる。従って、チェーンのブシュ等に巻き加工品を利用する場合、その軸方向寸法精度の維持が大きな課題となる。

【0008】本発明の目的は、円形開口ダイスに押し通す際、巻き加工品の塑性変形を所定部位に集中的に生じさせて、加工後における軸方向寸法精度の向上を図ること

とである。本発明の他の目的は、上記巻き加工品をチェーンの内プレートに圧嵌したブシュ、前記ブシュを挿通したローラ、又は、ローラに内嵌したブシュに利用し、チェーンの潤滑性能、チェーンの強度及びチェーンの寿命を向上させることである。本発明のさらに他の目的は、上記巻き加工品を製造するための方法を提供することである。

【0009】

【課題を解決するための手段】本発明は、矩形母材を巻き加工して円形開口ダイスに押し通してなるチェーン用巻き加工品において、該巻き加工品の周面に、円形開口ダイス押し通し時に塑性変形を吸収する複数の盲溝を設けたことにより前記課題を解決した。

【0010】

【作用】本発明による巻き加工品は、その予備成形品である円筒状成形品が円形開口ダイスへ進入するとき及び円形開口ダイスから脱出するとき、材料の塑性流動が主として盲溝に向って集中的に生じる。本発明で用いる

「盲溝」とは、端部に貫通していない溝のことである。

20 以上のように、塑性変形を特定の部位、すなわち、盲溝で吸収することにより、軸方向寸法を殆ど変化させることなく、精度良好な巻き加工品を得ることができる。また、巻き加工品の端部に盲溝が露出していないので潤滑剤の保油性が高く、チェーン用部品に用いた場合、良好な潤滑性能を得ることができる。

【0011】このような巻き加工品は、チェーンの内プレートに圧嵌したブシュ、ブシュを挿通したローラ、又は、ローラに内嵌したブシュに好適であり、チェーンの潤滑性能をさらに向上させることができる。

30 【0012】例えば、巻き加工品が内プレートに圧嵌したブシュである場合、盲溝は内周面及び外周面の少なくとも一方に形成される。このように構成することで、ブシュの内周面とピンの外周面において、及び、ブシュの外周面とローラの内周面との間において、盲溝が潤滑剤のためのポケットを形成することになり保油性が向上する。

40 【0013】また、例えば、巻き加工品がブシュを挿通したローラである場合、盲溝は内周面に形成される。このように構成することで、ブシュの外周面とローラの内周面との間において、盲溝が潤滑剤のためのポケットを形成することになり保油性が向上する。

【0014】なお、巻き加工品がローラに内嵌したブシュである場合、盲溝は内周面に形成される。ブシュ内嵌ローラは、内プレートに圧嵌したブシュ又は外プレートに圧嵌したピンと摺動するものである。このように構成することで、ブシュ内嵌ローラの内周面と、ブシュ又はピンの外周面との摺動面において盲溝が潤滑剤のためのポケットを形成することになり保油性が向上する。

50 【0015】本発明の巻き加工品は、次のようにして製造される。まず、側縁から所定間隔をおいて複数の盲溝

が形成された帯鋼が用意される。盲溝はロール加工等により予め形成されている。この帯鋼が矩形母材に切断される。そして、切断面が対峙するように矩形母材が円筒状成形品に成形機等の手段で巻き加工される。次に、円筒状成形品に巻き芯が挿入され、この円筒状成形品が円形開口ダイスに押し通される。このとき、円筒状成形品の材料に塑性流動が生じる。そして、この塑性流動は盲溝に向って集中的に生じる。従って、完成品として巻き加工品の軸方向寸法に大きな変化が生じることがない。

【0016】

【実施例】以下、図面を参照して本発明による実施例を説明する。図1乃至図5は、本発明による巻き加工品の第1実施例を示す。本実施例の場合、巻き加工品は内プレートに圧入したブシュである。巻き加工品24は、帯鋼10を所定寸法の矩形母材12に切断し、切断面14が対峙するように矩形母材12を成形機等の手段で円筒状成形品16に巻き加工し、円筒状成形品16に巻き芯18を挿入し、円形開口ダイス20に円筒状成形品16を押し通して製造される。

【0017】帯鋼10には、一方の表面に盲溝22が形成されている。本実施例の盲溝22は、帯鋼10の幅方向に延びている。しかし、盲溝22は幅方向に貫通していない。盲溝22同士は互いに平行である。

【0018】図4に示すように、この円筒状成形品16を円形開口ダイス20に押し通す際、円筒状成形品16の材料に塑性流動が生じる。この塑性流動は、盲溝22に向って集中的に生じる。そのため、円筒状成形品16に巻き芯18を挿入して円形開口ダイス20に押し通す際、盲溝が塑性変形を吸収して軸方向への寸法変化が殆ど生じさせることなく、巻き加工品24を製造することができる。

【0019】さらに、本発明の巻き加工品24では、盲溝22が端部に貫通していない。溝を端部に貫通させた場合、塑性変形が盲溝に吸収されず、端部から外方へ生じることによって端部において軸方向の凹凸が形成される。その結果、完成品として巻き加工品24は軸方向寸法精度が低下する。従って、盲溝22を円筒状成形品16の端部に貫通させないことが重要である。

【0020】そして、図5に示す如く、ブシュ24が内プレート26に圧入され、ピン28が挿通されてチェーンが構成される。ブシュに本発明の巻き加工品を利用することによって、軸方向寸法精度が向上するので、内プレート26間の寸法や内プレートと外プレート30との隙間を適正に保つことができる。また、ブシュ24が内プレート26内に没入したり突出したりすることなく、内プレート26と正しく圧入するので、チェーン全体の強度の維持及び摩耗の防止等の効果を奏する。なお、ローラは必ずしも必要でない。

【0021】材料の塑性流動を盲溝22に向って生じさせるには、溝を端部に貫通させないに加えて、矩形

母材12の総表面積のうち盲溝22が占有する面積を大きくすることも重要である。本実施例の巻き加工品24は、同じ長さの盲溝22を帯鋼10の長手方向に整列させることで、盲溝22が占有する面積を最大限にすることができ、材料の塑性流動を盲溝22に集中させやすい。また、本実施例の巻き加工品24は盲溝22の形状が単純であるため、このような盲溝22を帯鋼10にロール加工することも容易である。

【0022】図6乃至図9は他の実施例を示す。図6及び図7は、ローラチェーンのローラ及びブシュに本発明の巻き加工品を利用した実施例である。図8及び図9は、ローラに内嵌したブシュに本発明の巻き加工品を利用した実施例である。

【0023】図6は、内周面に複数の盲溝32を設けたローラ34を示している。ブシュ36とローラ34の摺動面に潤滑剤のポケットが形成される。図7は、内周面及び外周面にそれぞれ複数の盲溝38、40を設けたブシュ42と、内周面に複数の盲溝44を設けたローラ46を示している。ブシュ42とピン48の摺動面と、ブシュ42とローラ46の摺動面に潤滑剤のポケットが形成される。

【0024】図8は、ローラ50に内嵌したブシュ52の内周面に盲溝54を設けた実施例である。内プレート56に圧入したブシュ58とブシュ52の摺動面に潤滑剤のポケットが形成される。図9は、アキュムレートコンベヤチェーンとして代表的なサイドローラチェーンに本発明の巻き加工品を利用し、該チェーンのサイドローラ60に内嵌したブシュ62の内周面に盲溝64を設けたものである。なお、センターローラチェーンやトップローラチェーンのローラに内嵌したブシュに盲溝が設けられる場合もある。

【0025】図10乃至図12は、本発明による巻き加工品の他の実施例を展開図により示している。異なる構成は盲溝の形状である。

【0026】図10の巻き加工品では、盲溝66が千鳥状に形成される。従って、矩形母材が円筒状成形品に巻き加工されたとき、径方向の剪断強度が大きい。本実施例の巻き加工品は、スプロケットと啮合するチェーン用ローラに好適である。また、盲溝26が細分化されているので、潤滑剤の保油性が良好である。

【0027】図11の巻き加工品は、図1に示される1つの盲溝を複数に分割したものである。本実施例の巻き加工品は、図10の実施例同様、盲溝68が細分化されているので、潤滑剤の保油性が良好である。また、盲溝68を形成するロールの製作が容易である。

【0028】図12の巻き加工品は、図1に示される盲溝を傾斜させたものである。本実施例の巻き加工品は、塑性変形を盲溝70に吸収させやすいので、巻き加工品の軸方向寸法変化量を最小限に抑えることができる。また、巻き加工品にクラックが発生するとき、クラックの

方向（軸方向）と盲溝70が延びる方向が異なるので、上記実施例よりも破壊強度が大きい。

【0029】

【発明の効果】本発明の巻き加工品は複数の盲溝が設けられているので、円形開口ダイス押し通し時、塑性変形が盲溝に向って生じ、巻き加工品の軸方向長さ変化及びその寸法のばらつきを小さくすることができる。そして、溝が軸方向端部に露出していないことから保油性が高く、巻き加工品をチェーン用部品として用いた場合、良好な潤滑性を得ることができる。

【0030】請求項2の発明では、巻き加工品をチェーン用部品のプッシュとして利用し、プッシュとピンの摺動面や、プッシュとローラの摺動面に盲溝を形成することにより、この盲溝が潤滑油のためのポケットとして機能し、潤滑剤の保油性が向上してプッシュ及びローラの耐摩耗性を改善することができる。

【0031】請求項3の発明では、巻き加工品をプッシュを挿通するローラに利用し、プッシュとローラの摺動面に盲溝を形成することにより、この盲溝が潤滑油のためのポケットとして機能し、潤滑剤の保油性が向上してプッシュ及びローラの耐摩耗性を改善することができる。

【0032】請求項4の発明では、巻き加工品をローラに内嵌したプッシュに利用し、このプッシュとピンの摺動面や、このプッシュと内プレートに圧嵌したプッシュの摺動間に盲溝を形成することにより、この盲溝が潤滑油のためのポケットとして機能し、潤滑剤の保油性が向上してプッシュ及びピンの耐摩耗性を改善することができる。

【0033】請求項5の発明では、矩形母材を円筒状成形品に巻き加工した後、その円筒状成形品を円形開口ダイスに押し通す材料として、側縁から所定間隔をおいて複数の盲溝が形成された帯鋼を利用したので、円筒状成形品を円形開口ダイスに押し通す際の塑性変形は専ら盲溝に向って特定の方向に生じ、巻き加工品の軸方向寸法に大きな変化が生じることがなく、寸法精度良好なる巻き加工品を製造することができる。

【図面の簡単な説明】

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*【図1】 本発明による巻き加工品の素材となる帯鋼の斜視図である。

【図2】 図1の帯鋼を所定寸法に切断した矩形母材の斜視図である。

【図3】 図2の矩形母材を巻き加工した円筒状成形品の斜視図である。

【図4】 図3の円筒状成形品に巻き芯を挿入し、円形開口ダイスに押し通す工程を示す断面図である。

【図5】 図4の巻き加工品をプッシュとして利用したチェーンの部分断面図である。

【図6】 本発明の巻き加工品をローラとして利用したチェーンの部分断面図である。

【図7】 本発明の巻き加工品をプッシュ及びローラとして利用したチェーンの部分断面図である。

【図8】 本発明の巻き加工品をローラに内嵌したプッシュとして利用したチェーンの部分断面図である。

【図9】 本発明の巻き加工品をローラに内嵌したプッシュとして利用した他のチェーンの部分断面図である。

【図10】 本発明による巻き加工品の他の実施例を示す展開図である。

【図11】 本発明による巻き加工品の他の実施例を示す展開図である。

【図12】 本発明による巻き加工品の他の実施例を示す展開図である。

【図13】 本発明による巻き加工品が利用されるチェーンの斜視図である。

【符号の説明】

10 帯鋼

12 矩形母材

16 円筒状成形品

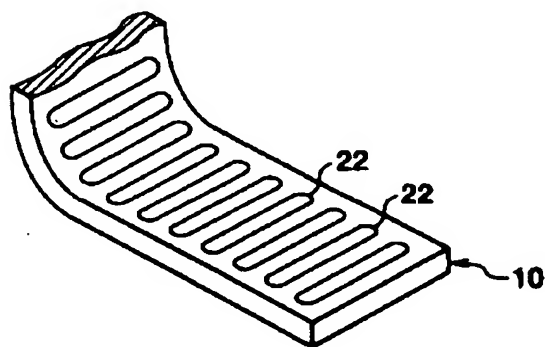
18 巻き芯

20 円形開口ダイス

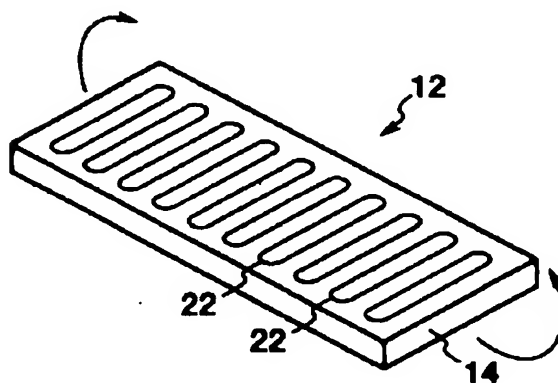
22, 32, 38, 40, 44, 66, 68, 70 盲溝

24 巻き加工品

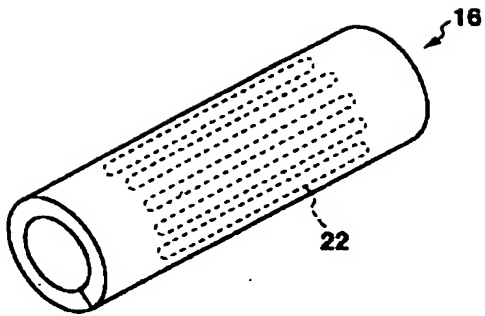
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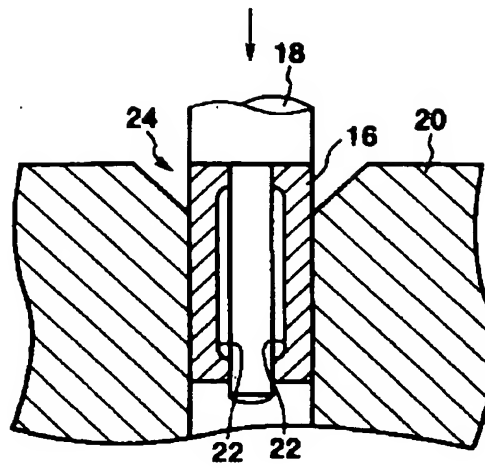
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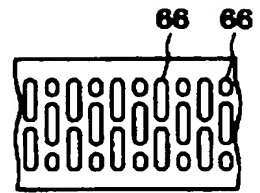
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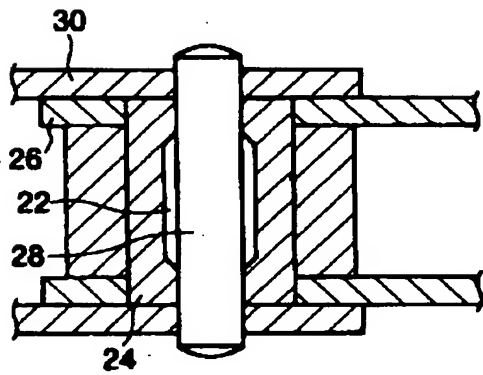
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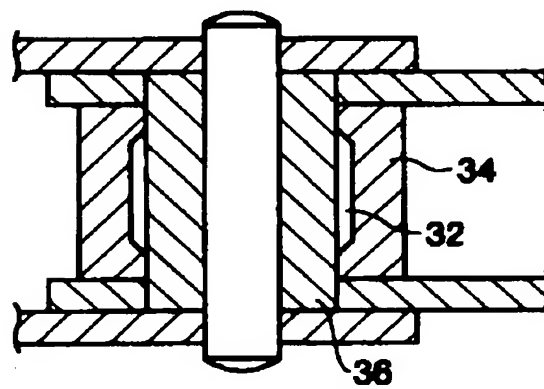
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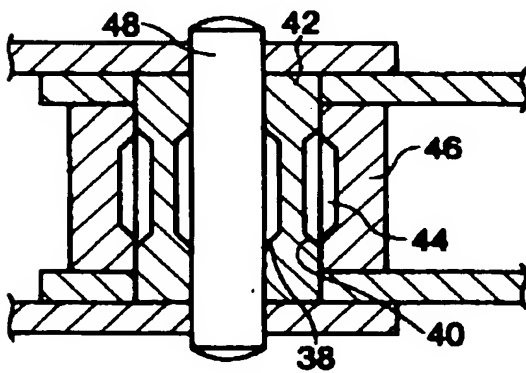
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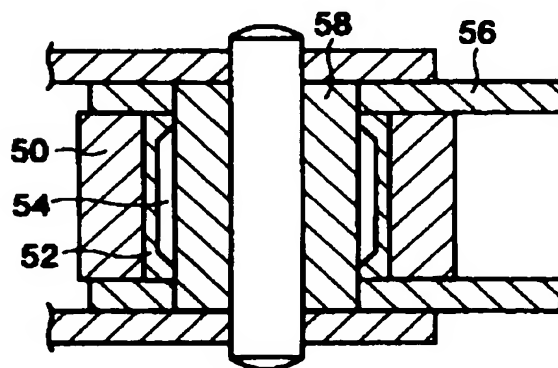
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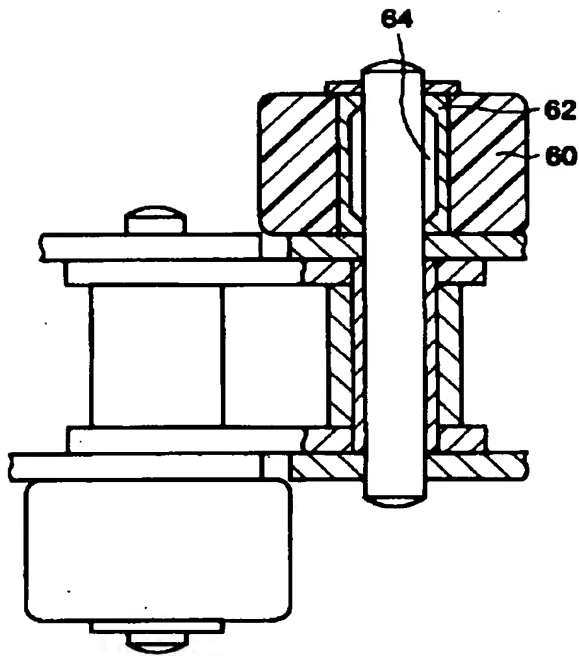
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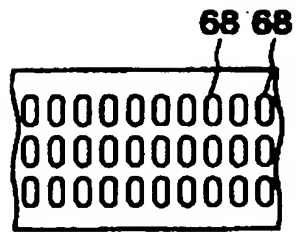
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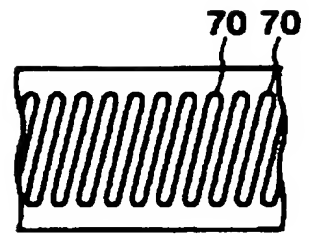
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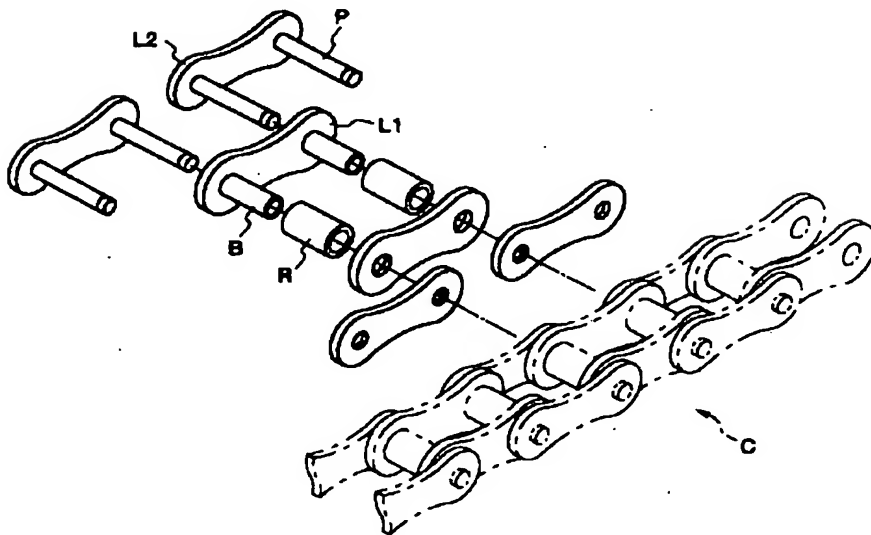
【図11】



【図12】



【図13】



フロントページの続き

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(56)参考文献 特開 昭 61-266826 (J P, A)
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実開 昭 58-157047 (J P, U)

(58)調査した分野(Int.Cl.⁸, D B 名)

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B21D 3/10

B21D 3/18

B21D 41/04

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CLAIMS

(57) [Claim(s)]

[Claim 1] A volume workpiece for chains which rolls and processes a rectangle base material and is characterized by preparing two or more blind ditches which absorb plastic deformation to a peripheral surface of this volume workpiece at the time of circular opening dice push through in a volume workpiece for chains which it comes to persist to a circular opening dice.

[Claim 2] A volume workpiece for chains of claim 1 which is the bush where said volume workpiece ****(ed) both ends on an inner plate.

[Claim 3] A volume workpiece for chains according to claim 1 which said volume workpiece is the roller which inserted in a bush which ****(ed) both ends on an inner plate, and formed said blind ditch in inner skin of this roller.

[Claim 4] A volume workpiece for chains according to claim 1 which is the bush which said volume workpiece inner-**(ed) on a roller.

[Claim 5] A manufacture method of a volume workpiece for chains which consists of cutting band steel with which two or more blind ditches were formed to a rectangle base material, confronting a cutting plane, winding and processing it into cylindrical mold goods, persisting in said cylindrical mold goods to a circular opening dice, and producing plastic deformation of said cylindrical mold goods toward said blind ditch.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[The technical field to which invention belongs] This invention relates to a suitable volume workpiece to use for the roller which inserted in the bush which ****(ed) on the inner plate which is the component part of a chain, and said bush, or a roller as a bush which inner-**(ed). Moreover, this invention relates to the method for manufacturing said volume workpiece.

[0002]

[Description of the Prior Art] Drawing 13 is the decomposition perspective diagram of a typical chain. This kind of chain C comes to have the roller R which inserted in Bush B between the pin P which is ****(ed) by the bush B ****(ed) by the inner plate L1 and the outside plate L2, and the inner plate L1 and the outside plate, and penetrates the inside of Bush B, and the inner plate L1, and makes lubricant come to be placed between the sliding portion between Pin P and Bushes B and between Bush B and Roller R. Moreover, the roller which inner-**(ed) the bush instead of Roller R may be used.

[0003] Bush B is cylindrical among these chain components, the rectangle base material which cut band steel is rolled with the means of a making machine etc., and it is processed, and is manufactured in many cases. JP,60-18850,B is indicating the method of rolling such a bush B and manufacturing by processing. According to this method, after rolling and processing a rectangle base material into cylindrical mold goods, in order to raise various dimensional accuracy, such as roundness, a volume workpiece persists in cylindrical mold goods to a circular opening dice, and is manufactured.

[0004]

[Problem(s) to be Solved by the Invention] However, by the above-mentioned method, in case it persists in cylindrical mold goods to a circular opening dice, cylindrical mold goods deform by the plastic flow of a material. Since cylindrical mold goods are rolled with a dice and it is compressed between the hearts, the plastic flow of a material is produced in shaft orientations, the volume workpiece as a finished product is deformed plastically, and shaft-orientations dimensional accuracy falls.

[0005] For example, the above-mentioned volume workpiece is used for the bush of a chain, and when the inner link assembly which consists of an inner plate and a bush on the basis of a bush shaft-orientations size is assembled, the outside width method of an inner link assembly varies. If the outside width method of an inner link assembly becomes short, the crevice between an outside plate and an inner plate will become large. Therefore, while a pin and the lubricant between bushes flow out and the lubricative ability of a chain falls, a crevice becomes a cause and noise generating and the fall of a chain on the strength arise. On the other hand, if the outside width method of an inner link assembly becomes long, the crevice between an outside plate and an inner plate will be lost, and poor crookedness of a chain will be produced.

[0006] Moreover, an inner link assembly may be assembled on the basis of the outside width method of an inner link assembly. If the shaft-orientations size of a bush is short at this time, that bush and fitting side of an inner plate will become small, and the fall of the fatigue strength by fitting force fall will arise. On the other hand, if the shaft-orientations size of a bush is long,

the bush which projects from the outside of an inner plate will slide with an outside plate, wear powder will be generated, and the life fall of a chain will arise.

[0007] When the above-mentioned volume workpiece is used for the bush which inner-**(ed) on the roller or the roller, problems, such as a fall of lubricative ability and a life fall of a chain, are produced by dispersion in a shaft-orientations size. Therefore, when winding around the bush of a chain etc. and using a workpiece, maintenance of the shaft-orientations dimensional accuracy serves as a big technical problem.

[0008] In case it persists in the purpose of this invention to a circular opening dice, it is making a predetermined part produce the plastic deformation of a volume workpiece intensively, and aiming at improvement in the shaft-orientations dimensional accuracy after processing. Other purposes of this invention are using for the bush which inner-**(ed) on the roller which inserted in the bush which ****(ed) the above-mentioned volume workpiece on the inner plate of a chain, and said bush, or the roller, and raising the lubricative ability of a chain, the reinforcement of a chain, and the life of a chain. The purpose of further others of this invention is offering the method for manufacturing the above-mentioned volume workpiece.

[0009]

[Means for Solving the Problem] This invention rolled and processed a rectangle base material, and solved said technical problem in a volume workpiece for chains which it comes to persist to a circular opening dice by having prepared two or more blind ditches which absorb plastic deformation to a peripheral surface of this volume workpiece at the time of circular opening dice push through.

[0010]

[Function] When the cylindrical mold goods which are the preforming article advance to a circular opening dice, and when escaping from a circular opening dice, the plastic flow of a material produces the volume workpiece by this invention intensively mainly toward a blind ditch. The "blind ditch" used by this invention is a slot which has not been penetrated at the edge. As mentioned above, a volume workpiece with a good precision can be obtained, without changing most shaft-orientations sizes by absorbing plastic deformation by the specific part, i.e., a blind ditch. Moreover, since the blind ditch is not exposed to the edge of a volume workpiece, the oil retentivity of lubricant is high, and when it uses for the components for chains, good lubricative ability can be obtained.

[0011] Such a volume workpiece is suitable for the bush which inner-**(ed) on the roller which inserted in the bush which ****(ed) on the inner plate of a chain, and the bush, or the roller, and can raise the lubricative ability of a chain further.

[0012] For example, a blind ditch is formed in either [at least] inner skin or a peripheral face when a volume workpiece is the bush which ****(ed) on the inner plate. Thus, with constituting, in the inner skin of a bush, and the peripheral face of a pin, a blind ditch will form the pocket for lubricant between the peripheral face of a bush, and the inner skin of a roller, and oil retentivity improves.

[0013] Moreover, for example, when a volume workpiece is the roller which inserted in the bush, a blind ditch is formed in inner skin. Thus, with constituting, a blind ditch will form the pocket for lubricant between the peripheral face of a bush, and the inner skin of a roller, and oil retentivity improves.

[0014] In addition, a blind ditch is formed in inner skin when a volume workpiece is the bush which inner-**(ed) on the roller. The ** roller in a bush slides with the pin which ****(ed) on the bush which ****(ed) on the inner plate, or the outside plate. Thus, with constituting, in the sliding surface of the inner skin of the ** roller in a bush, and the peripheral face of a bush or a pin, a blind ditch will form the pocket for lubricant, and oil retentivity improves.

[0015] The volume workpiece of this invention is manufactured as follows. First, the band steel with which the predetermined gap was set from the side edge, and two or more blind ditches were formed is prepared. The blind ditch is beforehand formed of roll processing etc. This band steel is cut by the rectangle base material. And a rectangle base material is rolled and processed into cylindrical mold goods with the means of a making machine etc. so that a cutting plane may confront each other. Next, it winds around cylindrical mold goods, the heart is inserted, and

these cylindrical mold goods persist at a circular opening dice. At this time, plastic flow arises into the material of cylindrical mold goods. And this plastic flow is intensively produced toward a blind ditch. Therefore, it winds as a finished product and a big change does not arise in the shaft-orientations size of a workpiece.

[0016]

[Example] Hereafter, the example by this invention is explained with reference to a drawing.

Drawing 1 thru/or drawing 5 show the 1st example of the volume workpiece by this invention. In the case of this example, a volume workpiece is the bush which ****(ed) on the inner plate. The volume workpiece 24 cuts band steel 10 to the rectangle base material 12 of a predetermined size, it rolls and processes the rectangle base material 12 into the cylindrical mold goods 16 with the means of a making machine etc. so that a cutting plane 14 may confront each other, is wound around the cylindrical mold goods 16, inserts the heart 18, persists in the cylindrical mold goods 16 to the circular opening dice 20, and is manufactured.

[0017] The blind ditch 22 is formed in band steel 10 on the surface of one side. The blind ditch 22 of this example is prolonged crosswise [of band steel 10]. However, the blind ditch 22 is not penetrated crosswise. Blind-ditch 22 comrades are mutually parallel.

[0018] As shown in drawing 4 , in case it persists in these cylindrical mold goods 16 to the circular opening dice 20, plastic flow arises into the material of the cylindrical mold goods 16. This plastic flow is intensively produced toward a blind ditch 22. Therefore, the volume workpiece 24 can be manufactured, without a blind ditch's absorbing plastic deformation and the dimensional change to shaft orientations making it almost generated, in case it winds around the cylindrical mold goods 16, the heart 18 is inserted and it persists to the circular opening dice 20.

[0019] Furthermore, in the volume workpiece 24 of this invention, the blind ditch 22 has not penetrated at the edge. When an edge is made to penetrate a slot, plastic deformation is not absorbed by the blind ditch, but it will be generated from an edge to the method of outside, and the irregularity of shaft orientations is formed in an edge. Consequently, it winds as a finished product and, as for a workpiece 24, shaft-orientations dimensional accuracy falls. Therefore, it is important not to make the edge of the cylindrical mold goods 16 penetrate a blind ditch 22.

[0020] And as shown in drawing 5 , a bush 24 is ****(ed) by the inner plate 26, a pin 28 is inserted in, and a chain is constituted. Since shaft-orientations dimensional accuracy therefore improves to use the volume workpiece of this invention for a bush, the size between the inner plates 26 and the crevice between an inner plate and the outside plate 30 can be kept proper. Moreover, since it **** correctly with the inner plate 26, without absorbing a bush 24 in the inner plate 26, or projecting, effects, such as maintenance of the reinforcement of the whole chain and prevention of wear, are done so. In addition, a roller is not necessarily required.

[0021] the plastic flow of a material is produced toward a blind ditch 22 -- being alike -- not making an edge penetrate a slot -- in addition, it is also important to enlarge area which a blind ditch 22 occupies among the total surface areas of the rectangle base material 12. By aligning the blind ditch 22 of the same length at the longitudinal direction of band steel 10, the volume workpiece 24 of this example can make the maximum area which a blind ditch 22 occupies, and is easy to centralize the plastic flow of a material on a blind ditch 22. Moreover, since the volume workpiece 24 of this example has the simple configuration of a blind ditch 22, it is easy to carry out roll processing of such a blind ditch 22 at band steel 10.

[0022] Drawing 6 thru/or drawing 9 show other examples. Drawing 6 and drawing 7 are the examples which used the volume workpiece of this invention for the roller and bush of a roller chain. Drawing 8 and drawing 9 are the examples which used the volume workpiece of this invention for the bush which inner-**(ed) on the roller.

[0023] Drawing 6 shows the roller 34 which formed two or more blind ditches 32 in inner skin. The pocket of lubricant is formed in the sliding surface of a bush 36 and a roller 34. Drawing 7 shows the bush 42 which formed two or more blind ditches 38 and 40 in inner skin and a peripheral face, respectively, and the roller 46 which formed two or more blind ditches 44 in inner skin. The pocket of lubricant is formed in a bush 42, the sliding surface of a pin 48, and the sliding surface of a bush 42 and a roller 46.

[0024] Drawing 8 is the example which formed the blind ditch 54 in the inner skin of the bush 52

which inner-**(ed) on the roller 50. The pocket of lubricant is formed in the sliding surface of the bush 58 which ****(ed) on the inner plate 56, and a bush 52. Drawing 9 uses the volume workpiece of this invention for a side-thrust-roller chain typical as an AKYUMU rate conveyor chain, and forms a blind ditch 64 in the inner skin of the bush 62 which inner-**(ed) to the side thrust roller 60 of this chain. In addition, a blind ditch may be prepared in the bush which inner-**(ed) on the roller of a pin center, large roller chain or a top roller chain.

[0025] Drawing 10 thru/or drawing 12 show other examples of the volume workpiece by this invention with the development. A different configuration is the configuration of a blind ditch.

[0026] In the volume workpiece of drawing 10, a blind ditch 66 is formed alternately. Therefore, when a rectangle base material is rolled and processed into cylindrical mold goods, the shear strength of the direction of a path is large. The volume workpiece of this example is suitable for the roller for chains which gears with a sprocket. Moreover, since the blind ditch 26 is subdivided, the oil retentivity of lubricant is good.

[0027] The volume workpiece of drawing 11 divides into plurality one blind ditch shown in drawing 1. Like the example of drawing 10, since the blind ditch 68 is subdivided, the volume workpiece of this example has the good oil retentivity of lubricant. Moreover, manufacture of the roll which forms a blind ditch 68 is easy.

[0028] The volume workpiece of drawing 12 makes the blind ditch shown in drawing 1 incline. Since the direction of a crack (shaft orientations) differs from the direction where a blind ditch 70 is prolonged when the amount of shaft-orientations dimensional changes of a volume workpiece can be stopped to the minimum and a crack occurs in a volume workpiece, since it is easy to make a blind ditch 70 absorb plastic deformation, the volume workpiece of this example has disruptive strength larger than the above-mentioned example.

[0029]

[Effect of the Invention] Since two or more blind ditches are prepared, at the time of circular opening dice push through, plastic deformation arises toward a blind ditch and the volume workpiece of this invention can make small dispersion in shaft-orientations length change of a volume workpiece and its size. And since the slot is not exposed to a shaft-orientations edge, oil retentivity is high, and good lubricity can be obtained when a volume workpiece is used as components for chains.

[0030] In invention of claim 2, by using a volume workpiece as a bush of the components for chains, and forming a blind ditch in the sliding surface of a bush, the sliding surface of a pin and a bush, and a roller, this blind ditch can function as a pocket for a lubricating oil, the oil retentivity of lubricant can improve, and the abrasion resistance of a bush and a roller can be improved.

[0031] In invention of claim 3, by using a volume workpiece for the roller which inserts in a bush, and forming a blind ditch in the sliding surface of a bush and a roller, this blind ditch can function as a pocket for a lubricating oil, the oil retentivity of lubricant can improve, and the abrasion resistance of a bush and a roller can be improved.

[0032] In invention of claim 4, by using for the bush which inner-**(ed) the volume workpiece on the roller, and forming a blind ditch between sliding of this bush, the sliding surface of a pin and this bush, and the bush that ****(ed) on the inner plate, this blind ditch can function as a pocket for a lubricating oil, the oil retentivity of lubricant can improve, and the abrasion resistance of a bush and a pin can be improved.

[0033] Since the band steel with which the predetermined gap was set from the side edge, and two or more blind ditches were formed as a material which persists in the cylindrical mold goods to a circular opening dice was used after rolling and processing a rectangle base material into cylindrical mold goods in invention of claim 5 It is chiefly generated in the specific direction toward a blind ditch, a big change does not arise in the shaft-orientations size of a volume workpiece, and the plastic deformation at the time of persisting in cylindrical mold goods to a circular opening dice can manufacture a volume workpiece with good dimensional accuracy.

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TECHNICAL FIELD

[The technical field to which invention belongs] This invention relates to a suitable volume workpiece to use for the roller which inserted in the bush which ***(ed) on the inner plate which is the component part of a chain, and said bush, or a roller as a bush which inner-**(ed). Moreover, this invention relates to the method for manufacturing said volume workpiece.

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PRIOR ART

[Description of the Prior Art] Drawing 13 is the decomposition perspective diagram of a typical chain. This kind of chain C comes to have the roller R which inserted in Bush B between the pin P which is ****(ed) by the bush B ****(ed) by the inner plate L1 and the outside plate L2, and the inner plate L1 and the outside plate, and penetrates the inside of Bush B, and the inner plate L1, and makes lubricant come to be placed between the sliding portion between Pin P and Bushes B and between Bush B and Roller R. Moreover, the roller which inner-**(ed) the bush instead of Roller R may be used.

[0003] Bush B is cylindrical among these chain components, the rectangle base material which cut band steel is rolled with the means of a making machine etc., and it is processed, and is manufactured in many cases. JP,60-18850,B is indicating the method of rolling such a bush B and manufacturing by processing. According to this method, after rolling and processing a rectangle base material into cylindrical mold goods, in order to raise various dimensional accuracy, such as roundness, a volume workpiece persists in cylindrical mold goods to a circular opening dice, and is manufactured.

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EFFECT OF THE INVENTION

[Effect of the Invention] Since two or more blind ditches are prepared, at the time of circular opening dice push through, plastic deformation arises toward a blind ditch and the volume workpiece of this invention can make small dispersion in shaft-orientations length change of a volume workpiece and its size. And since the slot is not exposed to a shaft-orientations edge, oil retentivity is high, and good lubricity can be obtained when a volume workpiece is used as components for chains.

[0030] In invention of claim 2, by using a volume workpiece as a bush of the components for chains, and forming a blind ditch in the sliding surface of a bush, the sliding surface of a pin and a bush, and a roller, this blind ditch can function as a pocket for a lubricating oil, the oil retentivity of lubricant can improve, and the abrasion resistance of a bush and a roller can be improved.

[0031] In invention of claim 3, by using a volume workpiece for the roller which inserts in a bush, and forming a blind ditch in the sliding surface of a bush and a roller, this blind ditch can function as a pocket for a lubricating oil, the oil retentivity of lubricant can improve, and the abrasion resistance of a bush and a roller can be improved.

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[0033] Since the band steel with which the predetermined gap was set from the side edge, and two or more blind ditches were formed as a material which persists in the cylindrical mold goods to a circular opening dice was used after rolling and processing a rectangle base material into cylindrical mold goods in invention of claim 5, It is chiefly generated in the specific direction toward a blind ditch, a big change does not arise in the shaft-orientations size of a volume workpiece, and the plastic deformation at the time of persisting in cylindrical mold goods to a circular opening dice can manufacture a volume workpiece with good dimensional accuracy.

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TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] However, by the above-mentioned method, in case it persists in cylindrical mold goods to a circular opening dice, cylindrical mold goods deform by the plastic flow of a material. Since cylindrical mold goods are rolled with a dice and it is compressed between the hearts, the plastic flow of a material is produced in shaft orientations, the volume workpiece as a finished product is deformed plastically, and shaft-orientations dimensional accuracy falls.

[0005] For example, the above-mentioned volume workpiece is used for the bush of a chain, and when the inner link assembly which consists of an inner plate and a bush on the basis of a bush shaft-orientations size is assembled, the outside width method of an inner link assembly varies. If the outside width method of an inner link assembly becomes short, the crevice between an outside plate and an inner plate will become large. Therefore, while a pin and the lubricant between bushes flow out and the lubricative ability of a chain falls, a crevice becomes a cause and noise generating and the fall of a chain on the strength arise. On the other hand, if the outside width method of an inner link assembly becomes long, the crevice between an outside plate and an inner plate will be lost, and poor crookedness of a chain will be produced.

[0006] Moreover, an inner link assembly may be assembled on the basis of the outside width method of an inner link assembly. If the shaft-orientations size of a bush is short at this time, that bush and fitting side of an inner plate will become small, and the fall of the fatigue strength by fitting force fall will arise. On the other hand, if the shaft-orientations size of a bush is long, the bush which projects from the outside of an inner plate will slide with an outside plate, wear powder will be generated, and the life fall of a chain will arise.

[0007] When the above-mentioned volume workpiece is used for the bush which inner-**(ed) on the roller or the roller, problems, such as a fall of lubricative ability and a life fall of a chain, are produced by dispersion in a shaft-orientations size. Therefore, when winding around the bush of a chain etc. and using a workpiece, maintenance of the shaft-orientations dimensional accuracy serves as a big technical problem.

[0008] In case it persists in the purpose of this invention to a circular opening dice, it is making a predetermined part produce the plastic deformation of a volume workpiece intensively, and aiming at improvement in the shaft-orientations dimensional accuracy after processing. Other purposes of this invention are using for the bush which inner-**(ed) on the roller which inserted in the bush which ****(ed) the above-mentioned volume workpiece on the inner plate of a chain, and said bush, or the roller, and raising the lubricative ability of a chain, the reinforcement of a chain, and the life of a chain. The purpose of further others of this invention is offering the method for manufacturing the above-mentioned volume workpiece.

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MEANS

[Means for Solving the Problem] This invention rolled and processed a rectangle base material, and solved said technical problem in a volume workpiece for chains which it comes to persist to a circular opening dice by having prepared two or more blind ditches which absorb plastic deformation to a peripheral surface of this volume workpiece at the time of circular opening dice push through.

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OPERATION

[Function] When the cylindrical mold goods which are the preforming article advance to a circular opening dice, and when escaping from a circular opening dice, the plastic flow of a material produces the volume workpiece by this invention intensively mainly toward a blind ditch. The "blind ditch" used by this invention is a slot which has not been penetrated at the edge. As mentioned above, a volume workpiece with a good precision can be obtained, without changing most shaft-orientations sizes by absorbing plastic deformation by the specific part, i.e., a blind ditch. Moreover, since the blind ditch is not exposed to the edge of a volume workpiece, the oil retentivity of lubricant is high, and when it uses for the components for chains, good lubricative ability can be obtained.

[0011] Such a volume workpiece is suitable for the bush which inner-**(ed) on the roller which inserted in the bush which ****(ed) on the inner plate of a chain, and the bush, or the roller, and can raise the lubricative ability of a chain further.

[0012] For example, a blind ditch is formed in either [at least] inner skin or a peripheral face when a volume workpiece is the bush which ****(ed) on the inner plate. Thus, with constituting, in the inner skin of a bush, and the peripheral face of a pin, a blind ditch will form the pocket for lubricant between the peripheral face of a bush, and the inner skin of a roller, and oil retentivity improves.

[0013] Moreover, for example, when a volume workpiece is the roller which inserted in the bush, a blind ditch is formed in inner skin. Thus, with constituting, a blind ditch will form the pocket for lubricant between the peripheral face of a bush, and the inner skin of a roller, and oil retentivity improves.

[0014] In addition, a blind ditch is formed in inner skin when a volume workpiece is the bush which inner-**(ed) on the roller. The ** roller in a bush slides with the pin which ****(ed) on the bush which ****(ed) on the inner plate, or the outside plate. Thus, with constituting, in the sliding surface of the inner skin of the ** roller in a bush, and the peripheral face of a bush or a pin, a blind ditch will form the pocket for lubricant, and oil retentivity improves.

[0015] The volume workpiece of this invention is manufactured as follows. First, the band steel with which the predetermined gap was set from the side edge, and two or more blind ditches were formed is prepared. The blind ditch is beforehand formed of roll processing etc. This band steel is cut by the rectangle base material. And a rectangle base material is rolled and processed into cylindrical mold goods with the means of a making machine etc. so that a cutting plane may confront each other. Next, it winds around cylindrical mold goods, the heart is inserted, and these cylindrical mold goods persist at a circular opening dice. At this time, plastic flow arises into the material of cylindrical mold goods. And this plastic flow is intensively produced toward a blind ditch. Therefore, it winds as a finished product and a big change does not arise in the shaft-orientations size of a workpiece.

[Translation done.]

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EXAMPLE

[Example] Hereafter, the example by this invention is explained with reference to a drawing. Drawing 1 thru/or drawing 5 show the 1st example of the volume workpiece by this invention. In the case of this example, a volume workpiece is the bush which ****(ed) on the inner plate. The volume workpiece 24 cuts band steel 10 to the rectangle base material 12 of a predetermined size, it rolls and processes the rectangle base material 12 into the cylindrical mold goods 16 with the means of a making machine etc. so that a cutting plane 14 may confront each other, is wound around the cylindrical mold goods 16, inserts the heart 18, persists in the cylindrical mold goods 16 to the circular opening dice 20, and is manufactured.

[0017] The blind ditch 22 is formed in band steel 10 on the surface of one side. The blind ditch 22 of this example is prolonged crosswise [of band steel 10]. However, the blind ditch 22 is not penetrated crosswise. Blind-ditch 22 comrades are mutually parallel.

[0018] As shown in drawing 4 , in case it persists in these cylindrical mold goods 16 to the circular opening dice 20, plastic flow arises into the material of the cylindrical mold goods 16. This plastic flow is intensively produced toward a blind ditch 22. Therefore, the volume workpiece 24 can be manufactured, without a blind ditch's absorbing plastic deformation and the dimensional change to shaft orientations making it almost generated, in case it winds around the cylindrical mold goods 16, the heart 18 is inserted and it persists to the circular opening dice 20.

[0019] Furthermore, in the volume workpiece 24 of this invention, the blind ditch 22 has not penetrated at the edge. When an edge is made to penetrate a slot, plastic deformation is not absorbed by the blind ditch, but it will be generated from an edge to the method of outside, and the irregularity of shaft orientations is formed in an edge. Consequently, it winds as a finished product and, as for a workpiece 24, shaft-orientations dimensional accuracy falls. Therefore, it is important not to make the edge of the cylindrical mold goods 16 penetrate a blind ditch 22.

[0020] And as shown in drawing 5 , a bush 24 is ****(ed) by the inner plate 26, a pin 28 is inserted in, and a chain is constituted. Since shaft-orientations dimensional accuracy therefore improves to use the volume workpiece of this invention for a bush, the size between the inner plates 26 and the crevice between an inner plate and the outside plate 30 can be kept proper. Moreover, since it **** correctly with the inner plate 26, without absorbing a bush 24 in the inner plate 26, or projecting, effects, such as maintenance of the reinforcement of the whole chain and prevention of wear, are done so. In addition, a roller is not necessarily required.

[0021] the plastic flow of a material is produced toward a blind ditch 22 -- being alike -- not making an edge penetrate a slot -- in addition, it is also important to enlarge area which a blind ditch 22 occupies among the total surface areas of the rectangle base material 12. By aligning the blind ditch 22 of the same length at the longitudinal direction of band steel 10, the volume workpiece 24 of this example can make the maximum area which a blind ditch 22 occupies, and is easy to centralize the plastic flow of a material on a blind ditch 22. Moreover, since the volume workpiece 24 of this example has the simple configuration of a blind ditch 22, it is easy to carry out roll processing of such a blind ditch 22 at band steel 10.

[0022] Drawing 6 thru/or drawing 9 show other examples. Drawing 6 and drawing 7 are the examples which used the volume workpiece of this invention for the roller and bush of a roller chain. Drawing 8 and drawing 9 are the examples which used the volume workpiece of this

invention for the bush which inner-**(ed) on the roller.

[0023] Drawing 6 shows the roller 34 which formed two or more blind ditches 32 in inner skin. The pocket of lubricant is formed in the sliding surface of a bush 36 and a roller 34. Drawing 7 shows the bush 42 which formed two or more blind ditches 38 and 40 in inner skin and a peripheral face, respectively, and the roller 46 which formed two or more blind ditches 44 in inner skin. The pocket of lubricant is formed in a bush 42, the sliding surface of a pin 48, and the sliding surface of a bush 42 and a roller 46.

[0024] Drawing 8 is the example which formed the blind ditch 54 in the inner skin of the bush 52 which inner-**(ed) on the roller 50. The pocket of lubricant is formed in the sliding surface of the bush 58 which ****(ed) on the inner plate 56, and a bush 52. Drawing 9 uses the volume workpiece of this invention for a side-thrust-roller chain typical as an AKYUMU rate conveyor chain, and forms a blind ditch 64 in the inner skin of the bush 62 which inner-**(ed) to the side thrust roller 60 of this chain. In addition, a blind ditch may be prepared in the bush which inner-**(ed) on the roller of a pin center, large roller chain or a top roller chain.

[0025] Drawing 10 thru/or drawing 12 show other examples of the volume workpiece by this invention with the development. A different configuration is the configuration of a blind ditch.

[0026] In the volume workpiece of drawing 10, a blind ditch 66 is formed alternately. Therefore, when a rectangle base material is rolled and processed into cylindrical mold goods, the shear strength of the direction of a path is large. The volume workpiece of this example is suitable for the roller for chains which gears with a sprocket. Moreover, since the blind ditch 26 is subdivided, the oil retentivity of lubricant is good.

[0027] The volume workpiece of drawing 11 divides into plurality one blind ditch shown in drawing 1. Like the example of drawing 10, since the blind ditch 68 is subdivided, the volume workpiece of this example has the good oil retentivity of lubricant. Moreover, manufacture of the roll which forms a blind ditch 68 is easy.

[0028] The volume workpiece of drawing 12 makes the blind ditch shown in drawing 1 incline. Since the direction of a crack (shaft orientations) differs from the direction where a blind ditch 70 is prolonged when the amount of shaft-orientations dimensional changes of a volume workpiece can be stopped to the minimum and a crack occurs in a volume workpiece, since it is easy to make a blind ditch 70 absorb plastic deformation, the volume workpiece of this example has disruptive strength larger than the above-mentioned example.

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is the perspective diagram of the band steel used as the material of the volume workpiece by this invention.

[Drawing 2] It is the perspective diagram of a rectangle base material which cut the band steel of drawing 1 in the predetermined size.

[Drawing 3] It is the perspective diagram of cylindrical mold goods which rolled and processed the rectangle base material of drawing 2 .

[Drawing 4] It is the cross section showing the production process in which winds around the cylindrical mold goods of drawing 3 , and inserts the heart, and it persists to a circular opening dice.

[Drawing 5] It is the fragmentary sectional view of a chain which used the volume workpiece of drawing 4 as a bush.

[Drawing 6] It is the fragmentary sectional view of a chain which used the volume workpiece of this invention as a roller.

[Drawing 7] It is the fragmentary sectional view of a chain which used the volume workpiece of this invention as a bush and a roller.

[Drawing 8] It is the fragmentary sectional view of a chain which used the volume workpiece of this invention for the roller as a bush which inner-**(ed).

[Drawing 9] It is the fragmentary sectional view of other chains which used the volume workpiece of this invention for the roller as a bush which inner-**(ed).

[Drawing 10] It is the development showing other examples of the volume workpiece by this invention.

[Drawing 11] It is the development showing other examples of the volume workpiece by this invention.

[Drawing 12] It is the development showing other examples of the volume workpiece by this invention.

[Drawing 13] It is the perspective diagram of the chain with which the volume workpiece by this invention is used.

[Description of Notations]

10 Band Steel

12 Rectangle Base Material

16 Cylindrical Mold Goods

18 Volume Heart

20 Circular Opening Dice

22, 32, 38, 40, 44, 66, 68, 70 Blind ditch

24 Volume Workpiece

[Translation done.]